



**Level 7 Materials Process Engineer (Degree)  
Apprenticeship (ST0659)**

**AM1 (Component 1): Work-Based Project Guidance**

**Version 1**

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## INTRODUCTION

An apprentice must undertake a work-based project during the End Point Assessment (EPA) period of the programme and submit this report to PIABC Limited for review by an independent assessor.

This work-based project is started after the apprentice has gone through the gateway process and must be submitted to PIABC Limited by the end of 30 weeks of the EPA at the latest.

The work-based project should be designed to ensure that the apprentice's work meets the needs of the business, is relevant to their role and allows the relevant KSBs to be demonstrated for the EPA. Therefore, the project's subject, title and scope will be agreed between the employer and PIABC Limited at the gateway. The employer will ensure it has a real business application and PIABC Limited will ensure it meets the requirements of the EPA (including suitable coverage of the KSBs assigned to this assessment method). PIABC Limited and employer will sign-off the project title to confirm its suitability at the gateway and prior to the project commencing.

At the gateway the following will be agreed as minimum requirements for the final project report:

1. Background
2. Outline of the issue or opportunity
3. Justification for the project
4. Evidence of effective research
5. Potential benefits (cost saving, improved productivity, quality) and drawbacks including commercial, contractual, and organisational etc.
6. Potential risks
7. Consideration of legislation, regulation, industry and organisational policies, procedures, and requirements
8. Proposed plan for implementation and work breakdown structure
9. Stakeholder engagement
10. Measures of success

This work-based project enables an apprentice to demonstrate a range of KSBs on a real piece of work which will add value to the employer. Employers have stated that any project that delivers real margin benefit to the business will be wholeheartedly supported by businesses. This means it is also cost effective.

The work-based project's report will enable an apprentice to demonstrate specific work-related tasks that have been completed in order to demonstrate how achievement of the required knowledge, skills, and behaviour (KSBs).

## KNOWLEDGE, SKILLS AND BEHAVIOURS (KSBs)

The Level 7 Material Process Engineer apprenticeship standard states that all apprentices will need to develop specialist KSBs. These KSBs will be generic and/or technology specific, but the subject areas indicated below will provide a foundation for an apprentice development in materials process engineering.

The KSBs of the of the Level 7 Material Process Engineer apprenticeship standard are set out below for Assessment Method 1 (AM1):

### Knowledge

- K1** Theories of team working
- K2** Principles of programme management
- K4** Risk management theories and practice
- K23** The principles of effective presentations (including planning, structuring, how and when to engage with the audience, using visual aids, presenting data)
- K24** Art of technical report writing
- K25** Principles of mentoring people
- K26** Fundamentals of casting process and technology\*
- K28** Fundamentals of coating processes and technology\*
- K29** Fundamentals of welding processes and technology\*
- K30** Fundamentals of brazing processes and technology\*
- K31** Fundamentals of heat treatment processes and technology\*
- K32** Fundamentals of surface treatment processes and technology\*

### Skills

- S1** Work within a team environment. This may include acting as a team leader with people management skills. They undertake risk analysis and problem solving on behalf of the team.
- S2** Communicate and present information appropriately and effectively taking account of target audience
- S3** Apply appropriate programme management tools. Typically, this would include a RACI chart, Project Plans, Load and Capacity analysis and cost analysis.
- S5** Mentor and support others using coaching skills and actively support continuous professional development.
- S7** Operate and control process equipment using continuous improvement methodologies
- S8** Apply process control procedures correctly and effectively
- S11** Make appropriate use of problem-solving tools (e.g. 8D, 5 whys)
- S12** Apply change control tools and practices
- S13** Apply risk management tools and techniques
- S15** Apply production control methods (e.g. planning and project management)
- S16** Correct use of specialist equipment and process knowledge\*

### Behaviours

A Material Process Engineer will be asked to demonstrate the following behaviours:

- B1** Working collaboratively - is comfortable in working in teams and being a team leader to agreed goals\*
- B3** Commitment to leadership - Taking personal responsibility for their actions, managing projects including resource management within their remit and able to mentor and instruct others in associated standards and best practice\*
- B5** Curiosity and Innovation Utilising own and others creativity to Improve the industry through embracing new technology and the digital world\*
- B6** System Thinking Seeing whole systems and parts and how they connect recognising interdependencies and integration\*

\* These KSBs are mapped to apprentice's specialist option (i.e. casting, coating, welding, brazing, heat treatment and surface treatment).

## THE WORK-BASED PROJECT

It represents and demonstrates the application of KSBs by the apprentices to meet the outcomes in the standard, as well as the approach to planning and completion of the work-based project. It:

- will take place during the EPA period once the work-based project's subject, title and scope has been agreed by the apprentice's employer and PIABC Limited at gateway.
- is expected that duration of the project will be typically around 6 months.
- is designed to assess apprentices in a consistent way, irrespective of their workplace.
- should be designed to ensure that the apprentice's work meets the needs of the business, is relevant to their role and allows the relevant KSBs to be demonstrated for the EPA.
- will be conducted as part of the apprentice's normal work. The employer will ensure the apprentice has sufficient time and the necessary resources to plan and undertake the work-based project. Any elements which need to be undertaken outside of normal work should be agreed between the employer and apprentice to ensure that the apprentice is not disadvantaged in any way from performing their job and can meet the requirements of the work-based project.

Whilst completing the work-based project, the apprentice should be subject to normal line management controls. The apprentice may work as part of a team which could include technical internal or external support however the report will be the apprentices own work and will be reflective of their own role and contribution.

The apprentice will need to consider the availability of company and external resources required to complete the work-based project. The apprentice must be fully aware of the KSBs the work-based project is intended to assess as that is what the grading of the work-based project will be based on.

All work relating to the project and report write-up, must be completed during the EPA period, excluding preliminary research to inform the project outline.

The work-based project should incorporate a stage review process. This is likely to be a monthly progress review with the employer to ensure the project and resources are on track as per the original project brief.

The completed work-based project will be submitted to the PIABC Limited by week 30 of the EPA for review by an independent assessor who will ensure that it demonstrates the relevant KSBs. It will be reviewed by the PIABC Limited's independent assessor before the presentation with questioning, which will take place soon after the work-based project has been reviewed.

The evidence presented by the apprentice in the work-based project must be valid, current, authentic, sufficient, and relevant to the standard. By this PIABC Limited mean:

- **Valid:** Relevant and appropriate to meet the KSBs criteria.
- **Current:** The evidence has been produced during the time the apprentice has been on the apprenticeship.
- **Authentic:** The evidence can be identified as the individual apprentice's own work and not that of someone else or a group of people. If produced by the apprentice, if evidence is team-based it must be able to clearly identify the apprentice's contribution
- **Sufficient:** There is enough evidence to be certain that performance to the required standard is consistent and could be achieved on more than one occasion.
- **Relevant:** There is a clear match between the item of evidence and the required KSBs criteria.

It is important to note that the work-based project is NOT:

- A report that a consultant would produce
- A description of the latest developments in an organisation
- A textbook or manual
- A narrative history of a company's successes or failures

## CHOOSING A WORK-BASED PROJECT TOPIC

The biggest hurdle lies not in technique of researching or carrying out the research or writing up the research, but in deciding a relevant work-related project that provides the opportunity for the apprentice to provide evidence of the core knowledge, skills and behaviours and the optional knowledge and skills dependent on the apprentice's job role.

The aim of the work-based project is to provide significant engineering advantage, address an engineering or business issue, provide business benefit(s) or deliver step change(s) in business performance.

The project may be based upon any of the following:

- A specific problem
- A recurring issue
- An idea/opportunity
- An improvement opportunity

Ideally, the work-based project should aid the employer's business and it has a real business application.

Examples of work-based project titles include:

- Yield improvement and Design for Zero Defects (DZD)
- Process Equipment Optimisation for improved efficiency and quality
- Process Failure Mode Effect Analysis applied to a manufacturing process
- Application of problem-solving techniques to manufacturing processes.
- Application of New Product and process Introduction in manufacturing engineering

- Design of manufacturing methods incorporating the whole supply chain

## DEFINING THE PROJECT

Once an apprentice has a topic idea, then the apprentice will need to define the work-based project. Try to write down just one or two sentences defining it project. This will provide a good test. “I want to research and write a project about.....”. Do not be too ambitious about the project. Many projects start off by being too ambitious in scope and must be reduced in scale – for example, a shorter time span, a smaller number of case-studies, fewer aspects of the problem to be researched.

## WORK-BASED PROJECT OUTLINE

Preliminary research to decide and scope the work-based project outline will be undertaken before the gateway and the apprentice will produce a detailed in a project outline of the work-based project as a gateway requirement.

The work-based project’s subject, title and scope will be agreed by the apprentice’s employer and EPAO at gateway and the time-period will start once this has been agreed.

The employer will ensure it has a real business application and PIABC Limited will ensure it meets the requirements of the EPA (including suitable coverage of the KSBs assigned). PIABC Limited and employer will then sign-off the project title to confirm its suitability at gateway and prior to the project commencing.

## WORK-BASED PROJECT CONTENT

The work-based project must include the following:

- An introduction
- The scope of the project (including key performance indicators)
- A project plan
- Technical decisions made, including supporting evidence linked to clear requirements
- Cost breakdown and consideration of financial options
- Research and findings, including details of any innovation
- Project outcomes, including operational problems overcome
- Recommendations and conclusions
- The report must include a one-page summary outlining recommendations (included in the word count).
- A summary of the project and the apprentice’s role and level of responsibility
- The key issues or challenges on the project
- The practical application of knowledge, skills, and behaviours
- The options considered, solutions identified and reasons why some options were not feasible
- What the apprentice achieved and how this was achieved
- The work-based project must map, in an appendix, how it evidences the relevant KSBs.

The scope must include problem definition, team structure and plan, research methodology, data analysis, discussion, stakeholder communications, findings, and recommendations.

Apprentices need to ensure that they write enough to ensure the end point assessment panel has enough information from which to deem the apprentice's competency.

While succinctness and clarity are features of good communication, apprentices must express themselves in sufficient detail, and produce enough evidence that the Independent Assessors are able to assess you as competent.

Apprentices must always adhere to confidentiality rules and protocols of their organisation when including any supporting evidence.

## SUBMISSION GUIDELINES

An apprentice is required to submit a project report. The project report should be a minimum of 8,000 words (+/-) excluding references, appendices and diagrams. Much too short or much too long implies that there was insufficient work on defining the work-based project. Please don't pad it out with wording.

The project report should be A4 and be in Arial font size 12 with double line spacing.

The footer should include the apprentice's full name/Unique Learner Number (ULN)/submission date.

It should be submitted in PDF format.

## REPORT WRITING GUIDANCE

For guidance on the layout and content of the work-based report, please see PIABC Limited's "*Report Writing Guidance*".

## PLAGIARISM

PIABC regards plagiarism as a very serious issue. Plagiarism is taking or using another person's thoughts, writings or inventions and presenting them as one's own. Apprentices needed to ensure that all work submitted to be assessed within their work-based project is their own work.

If an apprentice uses other people's work than it must be properly cited or referenced. If an apprentice does not cite or reference someone else's work, then this is called plagiarism. Dependent upon the amount of work which has been plagiarised an apprentice risk having their work-based project failed by the panel of assessors.

The following are examples of plagiarism:

- Downloading text from the web, without reference to the original source or using quotation marks and without using the material to answer the question or to support an argument.
- Quoting, re-writing, or scanning information from books without adequate reference.
- Copying information from colleagues and including this as if it were own work (whether modified or not).

The apprentice may work as part of a team which could include technical internal or external support however the work-based project report will be the apprentice's own work and will be reflective of their own role and contribution.

While discussing others work is an important part of an apprentice's research but the information must be referenced properly and written in an apprentice's own words or put into quotation marks. It is difficult to produce definitive guidelines for exactly what is or is not acceptable. To avoid any misunderstanding, always put quotations from other authors within quotation marks and give full references to every source used, even if not quoting directly from it.

The apprentice may work as part of a team which could include technical internal or external support however the report will be the apprentice's own work and will be reflective of their own role and contribution. Therefore, all work, statements, images, charts or ideas that are presented as an apprentice's own (i.e. not referenced) must be an apprentice's own work.

PIABC regards this as cheating and it can have serious consequences, even if it is unintentional.

Citing and referencing section above gives guidance for apprentices when using someone else's work.

When the work-based project report is submitted, the employer and the apprentice should verify the submitted work is that of the apprentice, authenticating the apprentice's contributions to the project. This is achieved by an employer sign-off and the apprentice submitting with the work-based project a covering sheet, which an apprentice confirms compliance with the following statement:

*"I declare that this work-based project is my own work. Where sources such as the internet, books and the work of others has been used; these sources have been fully acknowledged within the text and included in the references and bibliography on the last page. Any assistance given by others has been included in the acknowledgements."*

## **ASSESSMENT CRITERIA**

Apprentices will only be assessed on KSBs mapped to the core and the ones mapped to their specialist choice (see apprentice occupational standard for details).

PIABC Limited will assess the apprentice against the higher order descriptors outlined in the Pass and Distinction columns rather than the lower order knowledge, skills, and behaviours references in the second column. By showing competence against the higher order descriptors, then it will be assumed that the apprentice is working at or above the level outlined in the standard. The apprentice will be considered to have failed if they do not meet the criteria outlined in the pass descriptor.

Fail - The apprentice will be deemed to have failed if they do not meet the criteria outlined in the pass descriptor.

The following assessment criteria and full grading descriptors are for Assessment Method 1 (AM1) covering both the work-based project and presentation:

Area of Assessment	Method	Pass Criteria – The apprentice’s project must demonstrate that they:	A successful contribution at distinction will meet the pass criteria in all areas and meet seven of the individual distinction descriptors from the criteria below:
Application of technical knowledge	<p><b>K26</b> Fundamentals of casting process and technology*</p> <p><b>K28</b> Fundamentals of coating processes and technology*</p> <p><b>K29</b> Fundamentals of welding processes and technology*</p> <p><b>K30</b> Fundamentals of brazing processes and technology*</p> <p><b>K31</b> Fundamentals of heat treatment processes and technology*</p> <p><b>K32</b> Fundamentals of surface treatment processes and technology*</p>	Applies appropriate theoretical and technological methods to design, develop and commission engineering solutions, with reference to the appropriate process relating to their specialism.	Appraises solution and explains the risks and implications of the process, alternative approaches and ways to address them.

Area of Assessment	Method	Pass Criteria – The apprentice’s project must demonstrate that they:	A successful contribution at distinction will meet the pass criteria in all areas and meet seven of the individual distinction descriptors from the criteria below:
<p>Manage the delivery of innovative, stable and robust solutions with full integration into the Manufacturing ecosystem</p>	<p><b>S12</b> Apply change control procedures</p> <p><b>S15</b> Apply production control methods</p>	<p>Demonstrates resilience and determination in achieving project outcomes and that they are able to interact with team members and stakeholders to achieve successful outcomes.</p>	<p>Challenges the norm and investigates, proposes and articulates solutions outside the immediate business and industry sector, including researching new methods and technologies which could be applied to problems encountered in the material process engineer environment, demonstrated by supporting evidence.</p> <p>Demonstrates an understanding of the risks and implications to the business of the application of new technologies and in the way procedures and methods are selected, and unintended consequences to the business when they are applied (i.e they understand that solving problem A, can cause problem B and can weigh up the benefits).</p>
	<p><b>S16</b> Use of specialist equipment and process knowledge*</p> <p><b>B3</b> Commitment to leadership - Taking personal responsibility for their actions, managing projects including resource management within their remit and able to mentor and instruct others in associated standards and best practice*</p> <p><b>B5</b> Curiosity and Innovation - Utilising own and others creativity to Improve the industry through embracing new technology and the digital world*</p> <p><b>B6</b> System Thinking - Seeing whole systems and parts and how they connect recognising interdependencies and integration*</p>	<p>Proposes solutions based on in-house knowledge and expertise relating to specialist equipment and processes used in the company.</p> <p>Takes a broad view into account, looking at the whole system, not just component parts when making key decisions, embracing specialist equipment and new technology and communicating with stakeholders.</p> <p>Selects and interprets change control procedures and production methods, as appropriate, and applies the requirements leading to the successful delivery of the project.</p> <p>Evidence of consistent professional working practices, taking responsibility for their own actions with clear examples of leadership and followership. Approach demonstrates curiosity and innovation.</p>	

Area of Assessment	Method	Pass Criteria – The apprentice's project must demonstrate that they:	A successful contribution at distinction will meet the pass criteria in all areas and meet seven of the individual distinction descriptors from the criteria below:
Deliver Materials Process systems engineering/ operational solutions effectively	<b>K4</b> Risk management theories and practice	Leads the application of risk management tools and techniques meaning the engineering/operational solution is well managed and successfully implemented.	Interprets, critically evaluates and recommends actions to mitigate problems which have the potential to impact business performance for example, impact on product quality, cost and delivery.
	<b>S13</b> Use of risk management tools		
Lead/manage multi-disciplinary teams	<b>K25</b> Principles of mentoring people  <b>S5</b> Mentoring	Leads their team with appropriate mentoring/coaching for individuals within the team, understanding the importance of team values to support a high-performance work culture.	Demonstrate the ability to lead beyond the immediate team at organisational level and above to motivate and mentor people beyond those they directly line-manage to produce a high-performance work culture, showing insight into the needs and motivations of others.
Use of team and role play theory to develop high performance teams and individuals	<b>K1</b> Theories of team working  <b>S1</b> Working within a team environment  <b>B1</b> Working collaboratively - is comfortable in working in teams and being a team leader to agreed goals*	Demonstrates understanding of team and role theory and evidence of application of theory to produce intended outcomes.	Applies theory with insight and awareness of risks and rewards, describing how theory was applied with clear analysis of the impact and risks.

Area of Assessment	Method	Pass Criteria – The apprentice’s project must demonstrate that they:	A successful contribution at distinction will meet the pass criteria in all areas and meet seven of the individual distinction descriptors from the criteria below:
Manage the delivery of engineering solutions within a regulated sector	<b>K2</b> Principles of programme management  <b>S3</b> Use of programme management tools	Manages delivery with appropriate levels of planning, governance, implementation, and relevant risk management procedures pertaining to the discipline, and use of appropriate programme management tools.	Investigates innovative improvement methods and techniques and evaluates their suitability for use within the context of their discipline. Takes a leadership role in justifying the use of such tools and techniques and supporting the organisation in achieving benefits from using them.
Use of communication and influencing skills	<b>K23</b> Presentation Skills  <b>K24</b> Art of technical report writing	<p>Presents and communicates the key content and messages bounded by quality information pertaining to the discipline. Written report includes introduction, methodology, results and conclusion and defends choice of methods selected. Report takes account of the target audience, is grammatically correct and cohesive.</p> <p>Motivates and mentors team members in both their technical and professional development.</p>	<p>Drafts report in a way that ensures arguments flow from each other to a logical conclusion, which are outlined in a non-confrontational way, encouraging discussion.</p> <p>Responds to technical questioning during presentation with ability to argue and defend their view while showing respect for the opinions of others.</p> <p>Applies best practices with a disciplined and responsible approach to avoid risk through application of technical skills and mitigation strategies.</p>

Area of Assessment	Method	Pass Criteria – The apprentice’s project must demonstrate that they:	A successful contribution at distinction will meet the pass criteria in all areas and meet seven of the individual distinction descriptors from the criteria below:
Use six-sigma methodologies, problem	<b>S11</b> Make appropriate use of problem-solving tools	Applies improvement management tools and techniques meaning that the project is well managed and successfully implemented.	Demonstrates an understanding of problem-solving tools and the application of them and how they might enhance the business, selecting the most appropriate but discussing merits of alternatives.  Understands the risks and benefits of each when making the selection.
Use data analytics, process control methodologies and design principles	<b>S7</b> Operate and control process equipment  <b>S8</b> Apply process control procedures correctly and effectively	Demonstrates evidence that the correct selection of the approach is aligned with the problem being addressed within the work-based project. Well-structured approach to data analysis and how this is integrated into the process standards/controls pertaining to the discipline.	Compares a range of principles and techniques to enhance the robustness of decisions, is able to critique the various options and provide supporting evidence for justifying and defending preferred option.

\* These KSBs are mapped to apprentice’s specialist option (i.e. casting, coating, welding, brazing, heat treatment and surface treatment).

## GRADING

The following grading are for Assessment Method 1 (AM1) covering both the work-based project and presentation:

<b>KSBs</b>	<b>Fail</b>	<b>Pass</b>	<b>Distinction</b>
<b>K1 K2 K4 K23 K24 K25 K26 K28 K29 K30 K31 K32  S1 S2 S3 S5 S7 S8 S11 S12 S13 S15 S16  B1 B3 B5 B6</b>	The apprentice will be deemed to have failed the assessment method if they do not meet the criteria outlined in the pass descriptor.	In order to achieve a "pass" all of the pass descriptors mapped to this assessment method must be met.	In order to achieve a "distinction", all of the pass criteria and seven of the distinction criteria mapped against this assessment method must be met.

## SUCCESSFUL COMPLETION OF THE END POINT ASSESSMENT

For an apprentice to pass the end point assessment (EPA) as a whole and be deemed to be competent, the apprentice must pass all assessment methods (AM1: Work-Based Project and Presentation, AM2: Professional Review and the AM3: Knowledge and Skills Test).

Should the apprentice fail either AM1, AM2 or AM3 they are required to re-sit/re-take that component. The number of times an apprentice is permitted to re-sit/re-take the end point assessment and the date at which they do so is determined by the employer.